

**PATENT**

Atty Docket No.: 200310065-1

App Ser. No.: 10/657,527

**IN THE CLAIMS:**

*Please find below a listing of all of the pending claims. The statuses of the claims are set forth in parentheses.*

1. (Previously Presented) A method for correcting non-uniformity in luminance of an image generated by a projector and displayed obliquely on a screen having a surface, wherein the projector has a plurality of pixels for use in generating images and each projector pixel subtends to a corresponding projected area on the screen, the method comprising the steps of:

identifying, with a camera, the projector pixel that subtends to the largest projected area on the screen;

determining a ratio between the projected area of each pixel and the largest projected area;

organizing the ratio determined for each pixel into an attenuation array;

modifying luminance information of an input image received by the projector by the ratios of the attenuation array; and

utilizing the modified luminance information to drive the projector such that the image produced on the screen is uniform in luminance.

2. (Currently Amended) The method of claim 1 further comprising the step of generating a homography that maps between a first coordinate system relative to the projector, and a second coordinate system relative to the surface, and wherein the step of identifying is based on the ~~first projector-to-surface~~ homography.

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3. (Original) The method of claim 2 wherein
- the first coordinate system includes an  $x_p$  coordinate and a  $y_p$  coordinate;
  - the projector to surface homography includes parameters  $h_7$ ,  $h_8$  and  $h_9$ ;
  - the step of identifying comprises the step of calculating a value,  $w$ , for each pixel represented by coordinates  $x_p$ ,  $y_p$  wherein  $w$  is equal to  $|h_7x_p + h_8y_p + h_9|$  and determining which projector pixel has the smallest calculated value of  $w$ .
4. (Currently Amended) The method of claim 2 wherein the step of generating the projector to surface homography comprises the steps of:
- capturing one or more images produced by the projector on the screen with the camera;
  - determining the coordinates of each of ~~[[the]]~~ at least four projector pixels in the first coordinate system, which is relative to the projector, and in a third coordinate system that is relative to the camera; and
  - processing the coordinates of the at least four projector pixels in both the first and third coordinate systems to generate the projector to surface homography.

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5. (Original) The method of claim 4 wherein the camera has an optical axis that is perpendicular with the surface in all planes, and the step of generating the projector to surface homography comprises the steps of:

generating a projector to camera homography based upon the determination of the coordinates of the at least four projector pixels in both the first and third coordinate systems; and

equating the projector to camera homography with the projector to surface homography.

6. (Previously Presented) The method of claim 1 further comprising the step of positioning the camera substantially perpendicular to the surface of the screen, the camera and the projector having different optical axes relative to the surface of the screen.

7. (Currently Amended) A system for correcting luminance of an image displayed with an oblique shape on a screen having a surface, the system comprising:

a projector for generating the image, the projector having a non-perpendicular optical axis relative to the surface of the screen;

a camera for capturing the image, the camera having a substantially perpendicular optical axis relative to the surface of the screen;

a luminance correction engine for receiving the captured image from the camera, said luminance correction engine being configured to determine a ratio between a projected area of each pixel and the largest projected area on the screen, to organize the ratio determined for each pixel into an attenuation array, and to sending-an the attenuation array to the projector,

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[[and]] wherein the projector receives the attenuation array and modifies the luminance of the image.

8. (Previously Presented) The system of claim 7, wherein the attenuation array includes a first coordinate system representing the projector, a second coordinate system representing the surface, and a homography between the first coordinate system and the second coordinate system.

9. (Previously Presented) The system of claim 8, wherein the homography includes parameters  $h_7$ ,  $h_8$  and  $h_9$ , the first coordinate system includes an  $x_p$  and a  $y_p$  coordinate, and a value  $|h_7x_p + h_8y_p + h_9|$ .

10. (Previously Presented) The system of claim 7, wherein the luminance correction engine includes a spatial attenuation array for modifying the shape of the image.

11. (Currently Amended) An apparatus for correcting non-uniformity in luminance of an image generated by a projector and displayed obliquely on a screen having a surface, wherein the projector has a plurality of pixels for use in generating images and each projector pixel subtends to a corresponding projected area on the screen, the apparatus comprising:

means for capturing the image;

means for calculating an attenuation array based upon the captured image, wherein the means for calculating an attenuation array is configured to determine a ratio between the

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projected area of each pixel and the largest projected area on the screen to calculate the attenuation array;

means for modifying luminance information of an input image received by the projector by the attenuation array; and

means for driving the projector with the modified luminance information such that the image produced on the screen is uniform in luminance.

12. (Previously Presented) The apparatus of claim 11, further comprising:

means for calculating homographies between the means for capturing, the screen, and the projector; and

means for modifying a shape of the image based upon the homographies.

13. (Previously Presented) The apparatus of claim 11, further comprising:

means for identifying the projector pixel that subtends to the largest projected area on the screen; and

means for organizing the ratio determined for each pixel into an array.